with key, Fig. 3, are submitted. Comparatively weak magnetic fields were employed.[2] The two coincident deflecting fields are sketched in Fig. 3, in which the direction of

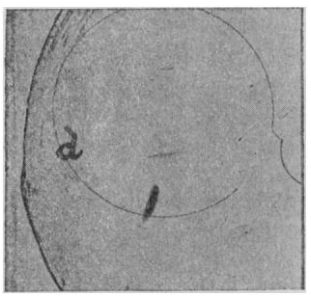

Fig. 1.

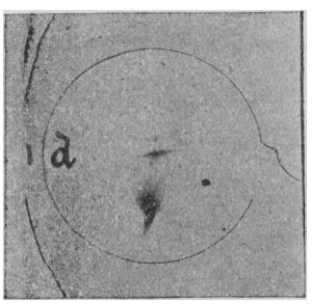

Fig. 2.

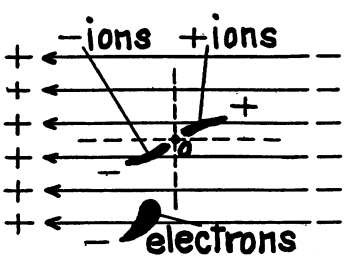

Fig. 3.

the electrostatic field is indicated by the minus and plus signs, while the arrow heads show the direction of the magnetic field. Again, magnetic deflections are up or down, while electrostatic deflections are to the right or left. The undeflected spot 0 is due to carriers that have lost their charge before entering the deflecting fields. In these photographs, Figs. 1 and 2, the traces due to the positive and negative ions unite at the central undeflected spot, the portion to the right of 0 being due to positive ions and that to the left negative ions, while the trace *e, due to electrons,* is distinctly separated from 0 and at some distance from it, and as we should expect, is in the same quadrant as the heavier negative ions. In Fig. 1 the time of exposure was 10 minutes, electrostatic field 2,070 volts per centimeter, magnetic field 1.7 amperes, and the vacuum .011 mm. mercury; while in Fig. 2 the corresponding values were 20 min., 2,070 volts, 2.25 amperes, and .005 mm. mercury. The effect of the stronger magnetic field is distinctly shown in Fig. 2 by the increased displacement from 0 of the trace due to the electrons.

[2] For arrangement of apparatus see C. T. Knipp, *Phys. Rev.*, Vol. XXXIV., March, 1912.

Chas. T. Knipp

Laboratory of Physics,
University of Illinois

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SECTION E—GEOLOGY AND GEOGRAPHY

The sixty-eighth meeting of Section E, Geology and Geography, of the American Association for the Advancement of Science, was held in Orton Hall, Ohio State University, Columbus, Ohio, December 28 and 29, 1915. Vice-president C. S. Prosser presided. Professor R. D. Salisbury, University of Chicago, was elected vice-president of the association, and chairman of Section E for the next meeting, to be held in New York. Dr. C. P. Berkey, Columbia University, was elected a member of the council, Dr. J. W. Beede, University of Indiana, a member of the sectional committee, and Dr. E. R. Cumings, University of Indiana, a member of the general committee.

The titles and abstracts of papers presented before Section E are given below:

The Classification of the Niagaran Formations of Western Ohio: Charles S. Prosser.

A series of sections along Ludlow Creek, near Covington and near Lewisburg in western Ohio, which extend from the upper part of the Richmond formation to near the top of the Niagaran series are fully described. Also the Derbyshire Falls section, near Laurel, Indiana, is described and it is shown that this important and well-known limestone extends into Ohio and is worked at several

quarries, as for example, the Lewisburg Stone Company, northwest of Lewisburg and the Jackson quarry, south of Covington. Dr. Foerste's name of Brassfield formation is adopted for what was formerly called the Clinton limestone in Ohio, and as the result of recent work by Schuchert and others it is to be correlated with the Medina rather than the Clinton formation of New York. If this correlation be accepted, then the Brassfield formation is to be transferred from the Niagaran to the Oswegan series of the Silurian system.

The following classification is proposed for these formations in western Ohio:

Silurian System
- Cayugan series.—Monroe Formation.
- Niagaran Series.
  - Cedarville dolomite. Lower 15 feet shown.
  - Springfield dolomite, 13 feet.
  - A mottled-colored zone which has been called West Union, 4 to 7 feet.
  - Laurel Limestone, 7 to 10 feet.
  - Osgood Beds
    - Shale zone, 2 to 3 feet.
    - Dayton limestone, 8 to 11 feet.
- Oswegan Series.
  - Brassfield limestone, 26½ to 28½ feet.
- Cincinnatian Series. Belfast bed at top of Richmond formation.

The Stratigraphic Position of the Hillsboro Sandstone: CHARLES S. PROSSER.

In Highland County in southern Ohio a sandstone composed of grains of quartz sand occurs which was named the Hillsboro sandstone by Dr. Orton and regarded as forming the uppermost division of the Niagaran series. In the summer of 1915 outcrops were found on the southern slope of Quaker Hill, about five miles north of Hillsboro, which give a better section than any that has previously been described. The hill is capped by the Ohio shale; below this is 13 feet of drab-colored compact limestone with the lithologic characters of the Monroe formation and containing fossils that occur only in this formation. Then 2½ feet of quartz sandstone is exposed which is the Hillsboro, and stratigraphically below this sandstone is limestone lithologically like the Monroe in which fossils were found that are known only in the Greenfield dolomite, which is the basal member of the Monroe formation. Twelve and one fourth feet below the exposed base of the upper sandstone is a 2-foot layer of similar sandstone which probably has been included in the Hillsboro sandstone and beneath this is nearly 3 feet of limestone still with the lithologic appearance of the Monroe, but fossils were not found in it. Under this zone is porous rock with the lithologic character of the Cedarville dolomite in which specimens of *Trimerella* were found, a genus of brachiopod shells that is known only in the Cedarville and Guelph formations of North America and the upper part of the Silurian in the Baltic region of Europe. The occurrence of fossils known only in the Greenfield member of the Monroe formation in rock lithologically like the Monroe below the higher layer of sandstone and the continuance of the rock with the lithologic appearance of the Monroe below the lower sandstone is believed to prove that the Hillsboro sandstone belongs in the Monroe formation like the somewhat similar lithologic Sylvania sandstone of northwestern Ohio and southeastern Michigan.

The Berea Formation of Ohio and Pennsylvania: WALTER A. VERWIEBE.

The Berea has been studied in Ohio notably by Dr. Prosser, in Crawford county, Pa., by I. C. White, and along the Allegheny river by Charles Butts. In 1915 the author made an attempt to correlate the work of these three investigators. As a result the following conclusions were reached: (1) The Berea is represented in Pennsylvania by the Corry and Cussewago formations of White. (2) The Corry sandstone increases in thickness when followed eastward from the state line, attaining a thickness of about 50 feet along the Allegheny River. (3) The Corry sandstone becomes gradually coarser toward the east. (4) A limestone layer is practically always to be found under the Corry. (5) The Cussewago sandstone thins out and disappears from the section about longitude 80° 5′ W. (6) The Corry sandstone is represented along the Allegheny River by the sandstone indicated on Mr. Butts's general section as lying about 160 feet above the sandstone labeled "Berea (Corry)." (7) The Berea is absent along the Allegheny River north of Tidioute. The sandstone regarded as the Berea north of this point is probably the Venango First Oil Sand.

The Origin of the Newark Series in the Philadelphia District: HELEN MORNINGSTAR.

In the cut made by the Philadelphia and Western Electric Railway at the De Kalb Street Station, Bridgeport, Pennsylvania, the lowest member of the Newark Series in the Philadelphia District, the Stockton, is well exposed and consists of alternating beds of red and gray sandstone and conglomerate with pebbles varying from a fraction

of an inch to four or five inches in diameter. The constituents of the rock are coarse quartz sand grains, quartz pebbles, mica and a large amount of decomposed feldspar. Crossbedding is very prominent, and the conglomerate lies in lens-shaped masses which are tilted in almost any direction. A black carbonaceous layer of a few inches in thickness is also found in the outcrop. The character of the rock at this locality seems to prove conclusively that it is of terrestrial origin and accumulated as fluviatile deposits on piedmont slopes under semi-arid climatic conditions. The origin can best be explained by comparison with the large alluvial deposits forming at the present time in the Valley of California between the Sierra Nevada Mountains and the Coast Range, where a semi-arid climate prevails, where there is a constant large supply of débris for the streams to transport, and where the change of gradient is sufficient for the deposition of the load. In such cases there is an assortment of sediments, the coarser materials being deposited in the piedmont regions while the finer materials are carried farther out. As the deposit seen in the Railway Cut at the locality described is situated on the extreme southeastern border of the Newark area in the vicinity of Philadelphia, it is best explained as the work of a stream which flowed into the region from the southeast, the coarse conglomerates representing a phase of alluvial deposition such as is found near the point where the stream emerges from a bordering highland. The crossbedding, such as found here, is a marked characteristic of alluvial deposits made by streams of an arid or semi-arid climate during the period of torrential rainfall. The red color of the rocks and the large amount of decomposed feldspar, also indicate semi-arid climatic conditions. The presence of the carbonaceous layer, the total absence of marine fauna, the ripple marks, sun cracks, animal tracks and the remains of land animals, which have been found in the Newark rocks of the Philadelphia District—all point toward a terrestrial or continental origin.

The Ordovician-Silurian Boundary in Ohio: W. H. Shideler.

Comparing the proposed new division plane at the base of the Richmond with the commonly accepted division at the top of the Richmond, 14 per cent. of the 395 Maysville species lived on into the Richmond, while not one of the 494 Richmond species lived on into the Medina or Clinton. Of the Richmond genera, 42 per cent. are unknown in the Maysville, compared with the 67 per cent. of the Medina and Clinton genera unknown in the Richmond. Three families end with the Maysville, fourteen with the Richmond. Three families first appear with the Richmond, while thirty-five families, two suborders, three orders and one subclass, are introduced in the Medina and Clinton. In Ohio the Belfast beds carry a fauna of Brassfield (Ohio "Clinton") species, so the top of the Richmond is at the top of the Elkhorn beds, and this position is taken as the Ordovician-Silurian boundary.

A Geological Section of the Lime Creek Beds of Iowa: A. O. Thomas.

Brecciation Effects in the Saint Louis Limestone: Francis M. Van Tuyl.

The Saint Louis limestone is locally much brecciated and disturbed in southeastern Iowa. Two main types of breccia may be recognized: First, an original breccia which occurs both as reefs and as stratified beds in the formation, and second, a subsequent breccia produced by mashing on a large scale in late Mississippian time. Small folds and overthrust faults are associated with the breccia of the last type.

An Organic Oolite from the Ordovician: Francis M. Van Tuyl.

The siliceous oolite which constitutes the transition bed between the St. Croix sandstone and Prairie du Chien dolomite in the Upper Mississippi valley possesses in addition to the ordinary concentric and radial structure minute sinuous tubules similar to those which characterize the calcareous alga, *Girvonella.*

The Stratigraphy of Flint Ridge, Ohio: Clara G. Mark.

Flint Ridge is located about forty miles east of Columbus and a few miles west of Zanesville, Ohio. It consists of a ridge extending in a general east and west direction and conspicuously higher than the surrounding country. All along its summit may be seen blocks of flint, many of them small, but some large enough to weigh several tons. These blocks of flint appear to be the broken-down fragments of a once continuous ledge. There has been a great diversity of opinion concerning the stratigraphic position of this flint and it has been tentatively assigned to various horizons, from that of the Lower Mercer limestone, to that of the Middle Kittanning, or No. VI., coal. In the spring of 1915 Mr. John Turkopp, a graduate student of Ohio State University, in making a geologic map

of Flint Ridge, found a gully in Poverty Run near the eastern end of the ridge, which shows the most complete section of the rocks below the flint that has yet been found. This paper gives a detailed account of this section, another one at the western end of the ridge, and for the purpose of correlation, one of Putnam Hill at Zanesville. Two limestones and two flints occur in the Poverty Run section. The upper limestone, which directly underlies the higher flint, resembles the Upper Putnam Hill limestone at Zanesville; the second limestone 27 feet below the base of the upper one resembles the Putnam Hill limestone, and a black flint 22¼ feet below the base of the lower limestone resembles the Upper Mercer limestone at the foot of Putnam Hill, Zanesville.

Correlation of the Conemaugh with the Kansas-Pennsylvanian: J. W. BEEDE.

The Cleveland Gas Field: J. A. BOWNOCKER.

A year or two after gas was discovered at Findlay in 1884 a deep well was sunk at Cleveland and a little gas secured but it was not of commercial proportions. Other tests were made from time to time but without success until February, 1912, when two good wells were secured in the "Clinton" sand at a depth of about 2,700 feet. A year later 150 strings of tools were at work and wells were sunk in large numbers on town lots and in this way much money wasted. The producing territory lay along the western edge of Cleveland and in the adjacent town of Lakewood. Later work has carried it some miles west of that place and southwest toward Berea. The largest well yet drilled in this field had an initial flow at the rate of 14,000,000 cubic feet per day and the closed or rock pressure of the field was about 1,050 pounds per square inch. The limits of this field have not been determined. In February, 1913, a large volume of gas was struck in the valley of the Cuyahoga, well within the city limits of Cleveland. The initial flow of the first well started at 10,000,000 cubic feet per day and other wells were sunk as rapidly as the drill could be forced down with the result that the limits of this field were soon determined while the proximity of wells made them short lived. The producing sand was not the "Clinton" but a higher one imbedded in the Silurian limestones. Rocks in the vicinity of Cleveland rise to the northwest and anticlines have not been located, though small ones may be present. Apparently the gas has worked its way from the southeast to the higher places, that is, to vicinity of Cleveland.

Oolitic Building Stone of the Bowling Green Field, Kentucky: M. H. CRUMP.

This remarkable building stone so beautifully seen in such handsome edifices as St. Thomas (Episcopal) Church, 53d street and Fifth avenue, New York; Hall of Records, Brooklyn; Manufacturer's Club, Philadelphia; the Everett mansion, Sheridan Circle, Washington, D. C.; and in many federal buildings throughout the United States, is found in the upper beds of the St. Louis limestone, covering an extent of some 200 miles in the county of Warren, state of Kentucky. It runs from ten to twenty-two feet thick, without a seam, and averages fifteen feet of commercial stone, which means 653,400 cubic feet per acre, or a total of more than eight and one third billion cubic feet immediately in sight, and ready to be put on the cars for less than ten cents per foot, where it is worth fifty cents. Professor Shaler speaks of it as "Occurring in layers of excellent form for use, readily worked, and with a rare quality of endurance—rather soft, so that it can be easily carved, but on exposure acquires much greater hardness. Add to this a rare beauty of color—a cream tint—and an endurance of color, and you have all the desirable qualities of a building stone well represented." Its ultimate crushing strength per square inch is 6,157 lbs., weight 167 lbs., carbonate of lime 97.69 per cent., water absorbed 6.2 per cent., U. S. Government Test.

Reames Cave: THOMAS M. HILLS.

Reames Cave, which is located in central Ohio, is the largest cave in the state. It occurs in zones B and C of an outlier of Columbus limestone, which was shaped by the ice and partly covered by drift. The total length of the galleries is nearly a mile. They have a maximum width of fifty feet. Deposition of iron oxide and calcium carbonate are being made contemporaneously.

Comparative Notes on the Loess of the Danube and the Rhine: B. SHIMEK.

The Loesses of the Mississippi Valley: B. SHIMEK.

A discussion of the several types of loess, with notes on their geographic distribution and stratigraphic relation. The several loesses represent distinct periods of time. Their peculiarities are, in part, accounted for by differences in source of materials.

Group Relationship among Physiographic Features as an Aid in Field Interpretation: GEORGE D. HUBBARD.

This paper shows what is meant by group relationship in physiography; how the notion of group relations among features is of value in description, explanation and classification of the features, and how a recognition of such relationships among features may be of assistance in the interpretation of field problems.

The Pleistocene of Capitol Hill, Des Moines, Ia.: James H. Lees.

Some Evidence Regarding the Duration of the Yarmouth Inter-glacial Epoch: George F. Kay.

That the time interval between the retreat of the Kansan ice and the advance of the Illinoian ice into Iowa was of long duration is suggested strongly by recent studies in the area of Kansan drift in southern Iowa. This view regarding the Yarmouth Inter-glacial epoch is supported by evidence as follows: (1) On the Kansan drift where erosion has been slight there is a thoroughly leached, non-laminated, tenacious clay called gumbo, twenty feet or more in thickness, which is thought to have been formed chiefly by chemical weathering of the upper part of the Kansan drift. (2) Diastrophic movements subsequent to the formation of the gumbo, the country having been elevated one hundred and fifty to two hundred feet. (3) A mature topography which was developed by erosion after the diastrophism and, apparently, in the main, before the close of the Yarmouth epoch.

Valley Trenching and Graduation Plains in Southern Indiana and Associated Regions: Clyde A. Malott.

This paper attempts to establish a partial peneplain in the central Mississippi valley post-Lafayette in age. East White River basin of southern Indiana furnishes the type region, where at least three former base levels are in evidence. Through the middle part of this river basin in the region of limestones and resistant sandstones, a gradation plain is evident at about eighty feet above the present streams. This gradation plain traced to the areas of soft rocks corresponds with the general upland level of the soft Devonian shale and lower member of the Knobstone group of middle eastern Indiana and of the soft sandstones and shales of the productive Coal Measures of the southwestern part of the state. At a hundred to a hundred fifty feet above this gradation plain is a peneplain of rather general prevalence in the harder rocks of the state. It is represented in the soft rock areas by monadnocks and rugged uplands only. This peneplain is called the Mitchell plain in southern Indiana. Again in the harder rocks is found a yet higher base-level, a hundred to two hundred feet above the Mitchell plain. This level is represented by monadnocks and flat-topped divides. It forms the highest land in the southern part of the state. The age of the gradation plain, marked by the lower uplands of the state, is found by tracing it across southern Illinois to the Ozark region, where it is seen to be developed at a lower level than the peneplain which has upon it the gravels of supposed Lafayette age. Moreover the Mitchell peneplain can be traced interruptedly by monadnocks to the Shawneetown Hills and Karbers Ridge which represent the level of the Lafayette gravel peneplain of the Ozark Plateau. The highest level of southern Indiana is correlated with the Lexington plain of Kentucky and the Highland Rim of Tennessee, and with less assurance with the base-level some two hundred feet above the Lafayette level of the Ozark region. In literature it is placed in early Tertiary age. Evidence of a post-Lafayette gradation plain or local peneplain is found in several places in the Mississippi valley. In the Nashville Basin of Tennessee the flat peneplain along Stones River is some eighty to a hundred feet below the frequent Lafayette gravel capped hills, and the stream is also trenched below the peneplain. Again, in the Driftless area of Wisconsin, broad "basin valleys" are found at one hundred feet lower than the Lancaster peneplain determined by Grant, Bain and others to be Lafayette in age. These "basin valleys" no doubt represent a gradation plain, and are in a position similar to the gradation plain of Indiana. Still another instance may be found in the Parker strata of the upper Ohio. Thus, taking all the evidence into consideration, it seems that there is a rather widespread base-level plain of post-Lafayette age over the Mississippi valley. In southern Indiana it was developed long before the advent of the Illinoian glacial ice.

The Extremes of Mountain Glacial Erosion: Wm. H. Hobbs.

In a series of articles printed in the year 1910, the writer pointed out that the mountain districts which in the past have been occupied by mountain glaciers, represent each a particular stage in a cycle of erosion, or especially of a receding hemicycle. The Bighorn range of Wyoming was cited as the best example of the early stage where glacial sculpture has modified but a small portion of the inherited upland surface. This topographic

type was designated a *grooved upland,* since the glacial troughs heading in semicircular cirques invade the upland. The opposite extreme, in which the entire inherited surface has been destroyed through glacial sculpture, was termed a *fretted upland* for obvious reasons, and the Alps cited as the type example. The characteristic of this type of upland—the Sierra—consists in main lines of palisades, or comb-ridges, from which lateral spurs of palisades diverge at frequent intervals. The general dominance of this type of topography in most regions where mountain glaciers have been, would seem to imply that mountain glacial sculpture proceeds with great rapidity through the enlargement and extension of the cirque; and that, further, this process is slowed down so soon as the pre-glacial upland has been removed. Otherwise we should expect that cols, or passes carved by cirque extension, would be much lower than they are.

A more extreme case of glacial sculpture seems to be illustrated by the northern Rocky Mountains, particularly within the Glacier National Park. Here in place of the comb-ridges, so characteristic of the fretted upland, we find an abundance of monument-like peaks, not the true horns merely within the fretted upland, but lower eminences which seem to have resulted from progressive lowering of the cols and the consequent coming into prominence of the broader parts of the comb ridges at either side of the entrance to the cirque from the U valley. This type of upland, an extreme product of mountain glacial erosion, we may designate a *monumented upland.* That the Bighorn range of Wyoming and the Glacier National Park thus present the extremes of mountain glacial erosion, was confirmed by studies which were carried out upon the ground in both districts during the summer of 1915.

The Earthquake in the Imperial Valley on June 22, 1915: W. H. HOBBS.

Outliers of the Maxville Limestone in Ohio, North of the Licking River: G. F. LAMB.

A Giant Pot-hole near Scranton, Pennsylvania: H. N. EATON.

The pot-hole in question is located about seven miles northeast of Scranton, Pa., in the ravine of a small stream on the southern side of Bald Mountain, 340 feet above the Lackawanna River. It is known to local naturalists and mining men on account of its great size, having a width at the top of 34 feet and a depth from the top to the débris at the bottom of 29 feet. The original depth was probably much greater. The bed rock is a gently dipping sandstone of a lower horizon of the Coal Measures. The origin of the hole by rotary abrasion is evident from its contour as shown in the photographs. Fluted and scoured rock surfaces in the immediate vicinity afford ample evidence of violent stream work, and although the glacial history of the region is not fully known it is probable that the pot-hole was formed by a stream issuing from the melting ice.

A New Occurrence of Crystallized Willemite: R. W. CLARK.

The willemite occurs in the Star District, Beaver County, Utah, in drusy masses of small crystals, which are sometimes colorless and sometimes red due to dilute coloring matter. It is associated with hemimorphite, calcite, mimetite, quartz, cerussite and limonite. The crystals show the following forms: c(0001), e(01$\bar{1}$2), a(11$\bar{2}$0), m(10$\bar{1}$0). The indices of refraction determined under the microscope by the immersion method are $\epsilon = 1.716$, $\omega = 1.690$.

The Girdled Mountain: A Direct Consequence of General Desert Erosion: CHARLES KEYES.

For the development of those rock-floored piedmonts which so often are characteristic of many arid regions there is an explanation much simpler than that usually given—one that is more in accordance with recent advancements in our knowledge of desert erosion. It does away with all of the assumptions necessarily arising out of the adoption of the old hypothesis which postulates prodigious valley-fill, and an uncovering by mountain freshets of an ancient bed-rock surface of the shallow margins of the intermont spaces. This old hypothesis had its foundation in the impression that the intermont plains are aggraded tracts instead of surfaces now undergoing rapid degradation, and that the agency is stream-corrasion much the same as in humid climates except perhaps somewhat less vigorous. The phenomenon is now believed to be one of the minor expressions of eolic erosion on that part of the orographic block which suffers maximum abrasion through natural sand-blast action. Many lofty desert mountains are thus deeply girdled just above the level at which the general plains surface meets them.

The Origin of the Coarse Breccia in the St. Louis Limestone: WILLIAM C. MORSE.

At least two kinds of breccia are present in the St. Louis limestone, one fine and the other coarse. The fine breccia is, in many cases, confined to a layer, or to two or three layers, at one or different

horizons, and undoubtedly owes its origin to forces operative at the time of deposition. The coarse breccia, on the other hand, is developed without regard to the limits of the layer and has a patchy, horizontal distribution. In one of the quarries in St. Louis County, Missouri, layers superjacent to a mass of coarsely brecciated limestone are bent down in such a way as to reveal the former presence of a limestone cavern. This structure in connection with other features led to the conclusion that the breccia is due to the collapse of the partially dissolved layers and of the cavern roof, and that the coarse breccia in western Illinois may have originated in a like manner.

Combination of Structures in the Colmar Oil Field in Western Illinois: WILLIAM C. MORSE.

In the Colmar Oil Field in western Illinois the Hoing sand is productive at 80 to 100 feet above sea level in the Lamoine terrace and at 165 feet in the adjacent Colmar dome. Salt water backs up the oil to the very edge of the terrace and, in fact, fills the lower part of the sand in the terrace itself. It likewise backs up the oil to the very crest of the dome. In some of the non-productive walls the sand is not present. From these facts it is evident that the sand in the terrace and in the dome constitutes two entirely separate patches; and recent development proves that the distribution of the oil and the salt water is dependent upon the structure of each individual patch of sand. In other words, the distribution of the oil and the salt water is not the result of the larger structure alone, but particularly that part of the larger structure within the limits of each sand patch. For example, the distribution of the oil in this area of elevated rocks is confined to the highest part of one patch of sand (terrace) and to the highest part of the other patch (dome).

Some Structural Geology of the Piedmont: JOHN E. SMITH.

The rocks under discussion are located in the "Slate and Schist Belt" in the eastern part of the Piedmont in North Carolina. A deep layer of mantle rock permits but few outcrops where unweathered material may be obtained for study. The sedimentary rocks consist of conglomerates, "slates," and breccias, each of which in places has been silicified. The gneisses and schists are derived from igneous and sedimentary rocks. These "Ancient Crystallines" are intensely folded, have steep dip with axes extending northeast and southwest in Orange County, are much reduced by erosion, and in many places have been cut by igneous intrusions and extrusions. The igneous rocks consist of granites, syenites and diorites, occurring as stocks some of which show zonation, and felsites, chiefly rhyolites, many of which have been sheared and altered. The rhyolites nearly all exhibit flow structure and appear prominently as rounded monadnocks and short ranges of low hills. The dikes are chiefly basic rocks. Contacts are rarely exposed. (Illustrated with structure sections.)

Geographic Causes in North Carolina: JOHN E. SMITH.

The natural divisions of North Carolina are the mountain region, the Piedmont plateau and the coastal plain. The climate varies with the elevation and with the distance from the sea, reaching its maximum range of temperature in the western part and the minimum along the coast. The rainfall is greatest in the southern part of the mountain region and near the sea. Some of the lake and swamp depressions of the coastal plain were formed by unequal deposition near the shore of a former sea and some by low barrier ridges built before the sea withdrew. The water in some of the lakes is partly of artesian origin. The railway systems are in topographic adjustment and there are two great power systems, one in the Piedmont and one on the coastal plain. The value of land is controlled by topography, fertility and accessibility, that of least value being the most remote in the mountains, the most rugged in the Piedmont, and the most swampy on the plain. Mills and factories are located chiefly in the Piedmont because those first built used water power. Hydro-electric is most popular now. Many of these industries came to the south to reduce expenses by operating in a mild winter climate near the raw materials used with cheap labor. The people of the state are distributed in accordance with the above-mentioned influences. (Illustrated with maps and charts.)

GEORGE F. KAY,
Secretary

SOCIETIES AND ACADEMIES

THE BIOLOGICAL SOCIETY OF WASHINGTON

THE 547th regular, and 36th annual meeting of the society was held in the Assembly Hall of the Cosmos Club, Saturday, December 18, 1915, called to order by President Bartsch, at 8 P.M., with 27 persons present.

On recommendation of the council the following persons were elected to active membership: H. R.